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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/690,997	10/21/2003	Gary David Tarver	200208108-1	5672

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EXAMINER	
BELL, BRUCE F	

ART UNIT	PAPER NUMBER
1746	

DATE MAILED: 08/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/690,997	TARVER, GARY DAVID	
	Examiner	Art Unit	
	Bruce F. Bell	1746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-65 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-65 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 21 October 2003 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 10/21/03
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claim 1, 3, 6, 7, 50-52, 54, 57 are rejected under 35 U.S.C. 102(b) as being anticipated by Tateishi et al (5643690).

Tateishi et al disclose a molten carbonate fuel cell that has a barrier of a silver solder that connects the interconnector to the current collector of the fuel cell. The barrier has a low melting point and is made of a conductive material having a melting point lower than the operating temperature of the fuel cell and is either an aluminum solder or a silver solder. The barrier having a melting point lower than the operating temperature of the fuel cell is filled in spaced formed between the oxidizing gas side of the collector plate and the interconnector, and the barrier is caused to melt as a result of the actuation of the fuel cell and the resultant molten barrier is pulled in an inner portion of the gap through a capillary action to fill the gap entirely. A gold solder to can also be used in the invention. See col. 7, lines 15-40.

The prior art of Tateishi et al anticipates the applicants instant invention. The examiner construes the metal interconnect as being the electrical conductor and the current collector as being a part of the fuel cell with the silver or gold or

aluminum solders as being the liquid metal interconnect. Therefore, the prior art of Tateishi et al anticipates the applicants instant invention as set forth in the instant claims.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Badding et al (US 2001/0044043) in combination with Ito et al (US 2003/0188637) and Paruchuri et al (6027575).

Badding et al disclose a solid oxide fuel cell having an enclosure 12 within which is disposed an electrolyte between two electrodes, wherein the fuel anode is open to access by fuel, while the cathode is open to access by oxygen. The air and fuel reservoirs 8 and 10 are separated by the electrolyte/electrode assembly. Electrical leads 6a and 7a provide pathways for electrical current passing to and from the electrodes 6 and 7. See paragraph [0038]. The material used for the electrodes has an ohmic resistance of not greater than 0.4 ohm-cm^2. See paragraph [0035]. The patent teaches that current collecting grids, cell interconnects, power leads and the like are attached to the fuel cell. See paragraph [0050]. The current conductors and electric leads are permanently attached to the electrode surfaces to provide bonded combinations which will

include at least one current conductor and at least on electrode with the electrode in electrical contact with both the current conductor and the electrolyte structure. See paragraph [0046]. The fuel reservoir is formed by edge-sealing the anode side of the electrolyte/electrode composite to a stainless steel backing sheet to form an envelope having a fuel inlet and outlet ports at opposing ends. The edge sealing of the envelope and inlet tube to prevent fuel leakage is by means of a stainless steel ceramic composite paste. See example 2.

Badding et al does not disclose a liquid metal interconnect to connect the anode and cathode to the electrical conductors.

Ito et al disclose a sealing technique in which a seal can be easily formed and which is excellent in reliability and heat cycle property in a high temperature region of 800 degrees C or higher so as to provide a composite body for a device that produces pure oxygen, oxygen-rich air and the like, a membrane reactor, a solid oxide fuel cell, an oxygen purification device, a heat exchanger or the like. See abstract. The composite body having a sealing property has a structure which has a reservoir formed by combining plural members and a metal member and has a sealing property characterized in that it is obtained by filling the metal member into the whole of a combined part between the members constituting the structure. The composite body having the sealing property has a structure that is made of ceramic or metal and the structure is constituted as a combination of a ceramic and ceramic, metal and metal or ceramic and metal. See paragraphs [0032] and [0035]. A silver or a silver alloy which has a lower softening temperature than the softening temperature of the members constituting the

structure so that the thermal expansion coefficients from room temperature to 850 degrees C are within the range as set forth in paragraph [0037]. The composite body having a sealing property is formed by inserting at least one kind of metal material which softens at a lower temperature than that of the members constituting the structure into the reservoir and heating at least the reservoir at a temperature in a range of not lower than softening temperature of the metal material inserted into the reservoir and lower than the softening temperature of the members constituting the structure so that the metal material is filled into the reservoir and at least a part of a combined boundary part between the members constituting the structure while being cured. See paragraph [0042]. Bonded bodies in each of which a mixed conducting ceramic dense body is thinly formed over a surface of a tubular mixed conducting ceramic porous body sealed at one end, are bonded with mixed-conducting ceramic dense bodies by silver. See paragraph [0179]. The problem of ceramic breakage can be solved by using a metal such as silver which softens at operation temperature of the device to secure a gas sealing property as well as to absorb thermal expansion difference between ceramic of the flange and the metal member by the bonding member. See paragraph [0233]. The invention as set forth has high reliability and an excellent sealing property can be provided at high temperature, which can increase a possibility of practical used in applications such as devices for producing pure oxygen, oxygen rich air, membrane reactors, solid oxide fuel cells and heat exchangers. See paragraph [0247]. A ceramic metal composite structure is realized in which a gas sealing property at high temperature is given

to a bonded part between ceramic and a metal member, durability against repetition of high temperature and room temperature is excellent and maintainability can be improved. See paragraph [0248].

Paruchuri et al disclose a self low temperature curing metallic adhesive with thermal and electrical conductivity. The past mixture of a liquid metal having a melting temperature below 30 degrees C and comprising 75-99.2% by wt. % gallium, along with aluminum or zinc, and optionally tin or indium and a metallic powder is disclosed. See abstract. The adhesive composition is formed by mixing a liquid metal comprising an alloy of gallium and aluminum or zinc with a metallic powder, to form a metallic adhesive paste that is used for forming electronic interconnections at low temperatures. See col. 1, lines 6-16. Metallic adhesives are an alternative to conventional metal alloy solders and comprise a mixture of liquid metal and particulates that form the solder joint when metal or metal alloy powders in the metallic adhesives react with the liquid metal of metal alloy. The solder joint has a high post curing melting temperature and provide a reliable solder interconnect for automotive use. The disclosed liquid metal is a gallium, gallium/indium or gallium/tin combination. The filler can be a gallium/copper/nickel paste which can solidify by amalgamation. See col. 2, lines 13-16. The liquid metal has a melting temperature below about 22 degrees Centigrade. See col. 2, lines 56-67.The metallic adhesive being curable at low temperatures minimizes damage to electronic components, substrates and already formed solder joints on the electronic circuits and these adhesives are reliable over extended time periods. See col. 3, lines 1-9. The metallic adhesive

is shown to have favorable thermal and electrical conductivity and satisfactory mechanical properties. See col. 3, lines 10-15.

The subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the instant invention was made because even though the prior art of Badding et al does not disclose the use of a liquid metal interconnect in their fuel cell assembly, the prior arts of Ito et al and Paruchuri et al show that this type of electrical interconnect is known to the person having ordinary skill in the art and would be known to be used to improve the resistivity of the connection between the conductor and the object to which it is connected. Further, this type of liquid metal interconnect is known for its ability to be formed at lower temperatures which improves the thermal and electrical conductivity, as well as giving satisfactory mechanical properties to the connection. This type of interconnect would further allow the connection to be made during the operation of the device which would minimize the production steps needed to assemble the device, yet make a good electrical connection. Further this type of connection could be utilized in practically any application or shape of device, since the material will soften at the application temperatures needed to operate the device and further will allow operation of the device for extended periods of time without failure, since the reliability of this type of interconnect has been found to be an improvement with devices that are cycled during operation. Therefore, the prior art of Badding et al in combination with Ito et al and Paruchuri et al render the applicants instant invention obvious for the reasons set forth above with respect to the instant claims. The recitations in the dependent limitations with respect to

the composition of the liquid interconnect appears to have been met, since applicants instant claims use the phrase "about" for percentages of the materials used and since the percentages of the materials used in the Paruchuri et al patent appear to meet these percentages due to the "about" language, the rejection appears to be proper.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bruce F. Bell whose telephone number is 571-272-1296. The examiner can normally be reached on Monday-Friday 6:30 AM - 3:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr can be reached on 571 272-1414. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

BFB
August 3, 2006

Bruce F. Bell
Primary Examiner
Art Unit 1746